CURRENT STATUS OF FISHERIES IN THE HAWAIIAN ISLANDS

by

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INTRODUCTION

Various aspects of commercial fishing in Hawaii can be traced back to ancient Hawaiian civilization, which was intimately tied to the sea. Because of their knowledge of fishing techniques, equipment, and life history aspects of many marine plants and animals, ancient Hawaiian fishermen were regarded as professionals and held in high esteem among the native villagers (Hobson and Chave 1972). The successive waves of foreign immigrants who brought alien fishing techniques with them led to the dilution of the influence of Hawaiian culture in fishing; nevertheless, traces of ancient Hawaiian culture in fishing techniques still persist. Some of the fishing methods introduced by the early immigrants together with Hawaiian cultural influences still exist today, such as in the pole-and-line and live-bait technique used in the fishery for skipjack tuna, Katsuwonus pelamis.

Today, despite occasional outcries that commercial fishing is moribund in Hawaii, there are still nearly 2,300 part-time and full-time licensed Hawaiian fishermen, some of whom manage ample financial returns for their effort. Compared to workers in other industries, however, the Hawaiian commercial fishermen's annual income is still relatively low despite the high prices charged for fish and fishery products. Fish in Hawaii today is a luxury food rather than a daily necessity as it was in ancient Polynesia (Manar 1969).

COMMERCIAL FISHERIES

Hawaii's commercial fisheries may be divided into two major categories--the offshore, pelagic fisheries conducted by the larger vessels such as those used in tuna fishing and the inshore, benthopelagic and demersal fisheries prosecuted by smaller crafts such as those engaged in mackerel purse seining, handline fishing, and trapping.

The Offshore Fisheries

Of all the fish species found in Hawaiian waters, the one most heavily exploited and believed to have the highest potential for future expansion, is the skipjack tuna. Every year, landings of skipjack tuna far exceed those of other species in the Hawaiian catch. From 1961 to 1978, for example, landings of skipjack tuna, which varied between 2,292 and 7,329 MT (metric tons) (average, 4,170 MT), represented about 69% of the State's total marine and pond catches. In addition, skipjack tuna represented about 85%, by weight, of all tunas landed.[1]

The present skipjack tuna fleet includes 15 vessels which are mostly old, wooden sampans built between 1927 and 1955. Only two steel-hulled vessels operate in the fishery--one built in 1947 and the other, a relatively recent addition, a 30.5-m vessel built in 1971. Skipjack tuna vessels range in size from 18 to 28 m in registered length and vary from 33 to 150 MT. They are capable of carrying between 6 and 14 men per fishing trip (Uchida 1967; Uchida and Sumida 1973).

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[1]Data are from Hawaii Division of Fish and Game, commercial fish catch, by species, 1961-78. (Mimeogr.)

The longline fishery for deep-swimming tunas and billfishes represents the second most important fishery in the Hawaiian Islands. Major species landed include yellowfin tuna, Thunnus albacares, bigeye tuna, T. obesus, albacore, T. alalunga, striped marlin, Tetrapturus audax, Pacific blue marlin, Makaira nigricans, black marlin, M. indica, broadbill swordfish, Xiphias gladius, sailfish, Istiophorus platypterus, and wahoo, Acanthocybium solandri. Of these, three species--yellowfin tuna, albacore, and wahoo--have shown significant increases in statewide landings in recent years; however, the increases are not associated with the longline fishery. Rather, they are attributable to increases in the number of trolling vessels and to some extent to larger landings of the pole-and-line and handline fishing vessels.

Most Hawaiian longliners use a scaled-down version of the Japanese gear, the basic unit of which is a basket. The mainline, which has five to seven branch lines or droppers, extends from about 0.25 to 0.36 km. A vessel may connect up to 70 baskets in one set. Recently built longliners in the Hawaiian fleet have shifted from baskets to the more efficient tub gear, which has a continuous mainline that extends on some vessels for over 50 km.

There are 14 longliners operating full time in the Hawaiian fishery at the present time. These vessels are mostly of wooden construction, but in recent years, new, steel-hulled vessels have joined the fleet. Hawaiian longliners range in size from 13 to 24 m in registered length and vary from 36 to 161 GT (gross tons). The smaller vessels may carry a crew of three to five men, but the newer, long-range vessels can carry as many as nine men on trips which may last up to 3 wk.

One of the most recent and possibly the most successful new fishery to develop in Hawaii is the troll fishery for albacore. Based on background information gathered through research done by the Honolulu and La Jolla Laboratories of the National Marine Fisheries Service on albacore movement in the North Pacific, a mid-Pacific albacore trolling project was initiated in 1975 to fish in the immediate vicinity of the Emperor Seamounts which are located 1,500 km northwest of Midway Islands near lat. 34°-36° N and long. 171°E. The information developed indicated that this area has considerable potential for an albacore surface fishery by trolling and possibly by pole-and-line methods during the summer.

When preliminary trolling results indicated that albacore, ranging from 3 to 16 kg, could be caught at rates as high as 500 per day, the State of Hawaii moved aggressively to obtain permission from the U.S. Navy to use Midway Islands as a refueling and transshipping base for the trollers. In 1979, 26 trollers ranging in size from about 18 to 21 m operated in this fishery. By fishing in the mid-Pacific from April, these trollers which traditionally fish the albacore grounds off the U.S. west coast from June or July through September or October extended their fishing time perhaps 2-3 mo (Altonn 1979; Cooke 1979).

The success of the albacore troll fishery is reflected in the landings. Whereas the annual landings of albacore mainly by the longline fishery around Hawaii in 1961-77 varied between 3 and 43 MT (average, 13 MT), the 1978 landing surpassed all previous landings, reaching 315 MT, of which 258 MT or 82% were landed by trollers fishing in the mid-Pacific. Early preliminary estimates place the 1979 landing at an astonishing 2,000 MT (Altonn 1979).

The Inshore Fishery

Around the Hawaiian Archipelago, the nearshore shelf zone unlike that supporting most of the world's great fishing areas is narrow and poorly developed, a condition which holds true for many oceanic islands in the central and western Pacific. The result is that only about 60 of the more than 680 species of fish, mostly found on the reef and over the narrow shelf slope zone, are commercially exploited. They are captured by a wide variety of gear including bottom line, handline, pole and line, bag net or purse seine, haul seine, pot, trap, anchored net, cast net, and gill net.

Of the inshore fish, the bigeye scad, Trachurops crumenophthalmus, is the most important followed by mackerel scad, Decapterus pinnulatus. The bigeye scad, second only to tunas and billfishes in total landings, is caught by three types of gear--bag net, which accounts for about 66% of the landings, handline, which lands about 20%, and gill net, which contributes about 13% (Kazama 1977). The main gear for mackerel scad are the hoop net, which accounts for slightly more than half of the catch, and the handline, which produces about 45%.

Vessels engaged in inshore fishing vary widely in size and shape ranging from small, wooden, metal, or fiberglass boats used by the weekend fishermen and which may fish only for one species, to the more recently introduced multipurpose vessels that may participate in various fisheries. One particular multipurpose vessel presently operating in various Hawaiian fisheries has a fiberglass hull, a registered length of 18 m, and a displacement of about 72 GT. It can carry a crew of nine men, has a range of 7,400 km, and has capabilities for conducting purse

seining, pole-and-line fishing, longline fishing, trapping, trolling, and handlining. The afterdeck has six baitwells for carrying live bait or holding catches alive until they can be landed for the fresh fish market. There are also provisions for freezing or brine chilling the catch. Multipurpose vessels of this type have been instrumental in opening up the newly discovered fishing and trapping grounds in waters of the NWHI (Northwestern Hawaiian Islands).

The important Hawaiian bottom fish fishery, conducted both in shallow and deep water, concentrates mainly on fishes of the snapper-grouper complex including snappers such as Pristipomoides filamentosus, P. sieboldii, P. zonatus, Aprion virescens, Etelis carbunculus, E. marshi, Lutjanus kasmira, Aphareus furcatus, and A. rutilans, a grouper, Epinephelus quernus, goatfishes, Parupeneus spp. and Mulloidichthys spp., and jacks, Seriola spp., Caranx spp., C. speciosus, Alectis spp., and Carangoides spp.

In the trap fishery for spiny lobster, Panulirus marginatus, catches have increased significantly in recent years. The lobster fishery in Hawaii goes back to pre-World War II years when it was concentrated only in the major Hawaiian Islands and catches were relatively small, averaging 15.5 MT annually. Wartime restrictions led to closure of many of the lobster grounds. When fishing resumed, catches reached 14.2 MT in 1944, climbed to 20.6 MT in 1947, then declined steadily until 1967 after which they stabilized between 2.0 and 4.2 MT until 1976.

The discovery by the Honolulu Laboratory in 1976-77 of new lobster trapping grounds in the NWHI, particularly around Necker Island and Maro Reef, brought about a renewed interest in lobster fishing. Long-range vessels capable of operating 2-3 wk without refueling or reprovisioning began fishing in the remote NWHI in late 1976. In 1977, these vessels produced a record catch of 38.9 MT of spiny lobsters, almost all of which was caught in waters of the NWHI. The 1978 catch, however, declined drastically, reaching only 15.3 MT.

RECREATIONAL FISHERY

A prominent feature of Hawaiian fisheries is the recreational fishery, in which a wide variety of boats, ranging from small skiffs to large charter vessels are used. The vessels that supply charter services, totaling 102 in 1976, troll for pelagic fish such as billfishes, tunas, mahimahi, and wahoo (Cooper and Adams 1978[2]). There are also numerous weekend fishermen who operate small boats and troll for pelagic fishes or use a variety of other gear for inshore species. In 1976, there were 1,544 noncharter, recreational-commercial trollers in the State. These vessels are operated by individuals in nonfishing occupations and who may be licensed; therefore, they are considered part-time commercial fishermen.

A survey conducted from July 1958 to June 1961 estimated that there were 122,400 recreational fishermen in the State at that time, but this number has undoubtedly increased substantially with an increase in the

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[2]Cooper, J. C., and M. F. Adams. 1978. Preliminary estimates of catch, sales, and revenue of game fish for the Fishery Conservation Zone around the main Hawaiian Islands, by types of troll and longline vessels and by species, 1976. Southwest Fisheries Center Admin. Rep. 24H, 1978, National Marine Fisheries Service, NOAA, Honolulu, Hawaii, 10 p.

population (Hoffman and Yamauchi 1973). At any rate, the survey showed that 68.1% of these recreational fishermen participated in saltwater shoreline fishing, 12.1% fished from boats, 10.2% were divers, and 9.6% were either freshwater fishermen or did not specify their preference in type of fishing.

FISH PROCESSING

Except for the tuna cannery operating in Honolulu, there are no other major fish processing plants in the Hawaiian Islands. Skipjack tuna caught in local waters are sold fresh, canned, cured, or sold as bait. By far, the largest proportion of the catch is canned and perhaps up to 1,600 MT sold fresh (Hawaii. State Center for Science Policy and Technology Assessment 1978). The market for cured fish and bait utilizes only very small amounts of skipjack tuna. Large tunas such as yellowfin tuna, bigeye tuna, and billfishes are sold fresh and surplus tunas are shipped to lucrative markets in the continental United States and Japan. Almost all other fish and shellfish landed in the Hawaiian Islands are sold fresh. The exceptions are bigeye scad and mackerel scad, some of which are cured, and the spiny lobster, which in addition to being sold live is processed as frozen tails. Hawaii's fish cake manufacturers who formerly used locally caught billfishes as the main ingredient have switched to imported Japanese surimi, which is a semiprocessed wet fish protein prepared from Alaska pollock, Theragra chalcogramma. Billfishes and scrap fish are also ground and mixed with surimi whenever they can be obtained inexpensively and in large enough quantities.

AQUACULTURE

The Hawaii Division of Fish and Game's Anuenue Fisheries Research Center, recognized as a world leader in the culture of Malaysian prawn, Macrobrachium rosenbergii, began research on prawn culture in 1965 (Fujimura and Okamoto 1970). During the period 1972-77, annual commercial production increased from 1.8 to 23.1 MT. In 1978, although the projection indicated a production of 80 MT, the final estimate appears to be closer to 50 MT (Hawaii. State Center for Science Policy and Technology Assessment 1978). The total area available for culture reached 36.4 ha in 1977 with a potential capacity for producing more than 90 MT ([Hawaii.] Department of Land and Natural Resources 1978).

Commercial pond production of catfish, Ictalurus punctatus, in Hawaii began in 1974 on a modest scale, but by 1977, 6.5 ha of ponds were in production, yielding 6,200 kg/ha/yr, a figure which is more than four times the 1,400 kg/ha/yr average attained by catfish producers in the continental United States. The higher production was attributed to Hawaii's warmer climate and year-round growing season (Hawaii. State Center for Science Policy and Technology Assessment 1978). Although final production figures are incomplete, the projected production for 1978 was 46 MT of catfish.

Hawaii has also embarked on development of a cultured oyster industry in recent years. Cultured oysters, including the Pacific oyster, Crassostrea gigas, the American oyster, C. virginica, and the flat oyster, Ostrea edulis, are already reaching consumers in Honolulu. Although production figures are not firm, the State's projection was a harvest of

about 45 MT in 1978. Private enterprises in the oyster producing business are pioneering the use of the sluice or raceway culture technique of setting the animals in trays and maintaining an intensive feeding schedule using algae which are produced in nearby ponds. Tests have shown that market-size oysters can be produced in 7-9 mo. Estimated production under this intensive culture system is 9.8 MT of oyster meat per algal production acre (equals 0.4 ha) per year (Hawaii. State Center for Science Policy and Technology Assessment 1978). One firm estimates that it will be producing 10 million oysters by 1981 (Dupont[3]).

IMPACT ON STATE AND LOCAL ECONOMIES

The value of the commercial fish catch in Hawaii remained relatively static from 1961 to 1970, never exceeding $4.0 million annually. In 1971, the value rose 34% to about $5.2 million, then showed a smaller 10% gain in 1972 to $5.7 million. From 1973 to 1975 the values fluctuated between $6.0 and $7.0 million, then rose to $8.9 million in 1976. The rise in value continued in 1977, up 16% to $10.3 million and reached a record $12.2 million in 1978 (see footnote 1).

The recreational fishery has had a very significant impact on Hawaii's economy. The total estimated annual expenditures of all recreational fishermen in the State reached $16.1 million during the period July 1958 to June 1961 (Hoffman and Yamauchi 1973). These expenditures were in three categories: (1) transportation costs, (2) food, beverages,

[3]James Dupont, Kahuku Sea Food Plantation, Kahuku, HI 96731. Pers. commun. September 1979.

and additional on-site living expenses, and (3) cost of gear and auxiliary equipment necessary for actual fishing. The economic impact of these expenditures on the State, measured in terms of additional income generated for the local economies, was estimated to be $11.5 million.

Although it would appear useful to compare the economic impact of recreational fishing with that of commercial fishing, no attempt at such a comparison has been made. The indications are, however, that recreational fishing provides significant benefits to Hawaii, far greater than that derived from commercial fishing.

It should be noted that in Hawaii a gray area exists between what constitutes recreational and commercial fishing and, therefore, the commercial catch may be undervalued. Recreational fishermen are not licensed by the State, because there is no provision in the regulations for doing so; therefore, they are not allowed to sell their catches. However, it has been noted that many recreational fishermen dispose of their catches through various retail outlets. The extent to which this violation occurs is unknown at the present time.

SUMMARY

Fishing in Hawaii dates back to the ancient Hawaiian civilization, which was intimately tied to the sea. Early Hawaiian fishing methods were gradually incorporated into new techniques introduced by immigrants. Some of these techniques still exist today.

The major offshore commercial fisheries in Hawaii are primarily for tunas and billfishes. Catches in the pole-and-line and longline fishery have not changed significantly over the years; however, changes have

occurred in vessel design and gear. A new and perhaps one of the most successful fishery to develop in Hawaii in recent years is the troll fishery for albacore in the mid-Pacific. This fishery has made a significant impact on the fisheries scene in Hawaii.

On inshore fishing, catches of bigeye scad, mackerel scad, and species comprising the snapper-grouper complex have not shown any notable trends. The major innovation among the inshore fleet appears in the use of multipurpose vessels that participate in several types of fishing. These vessels have been instrumental in the development of the fishery for spiny lobster in the NWHI.

An increasingly important feature of Hawaiian fisheries is recreational fishing in which millions of dollars are expended by fishing enthusiasts in pursuit of pelagic fishes such as tunas, billfishes, wahoo, and mahimahi. Economic studies indicated that recreational fishing provided important benefits to Hawaii's citizens, far greater than that derived from commercial fishing.

In fish processing, a large percentage of Hawaii's skipjack tuna and albacore catches are canned; however, about 1,600 MT of skipjack tuna, together with almost all other offshore and inshore fish, are marketed fresh. A limited amount of fish are cured or sold as bait.

Aquaculture has become an important industry in Hawaii and undoubtedly will have greater impact on the economy as production facilities and yield increase for Malaysian prawn, oysters, and channel catfish.

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